

WHAT IS CLAIMED IS:

1. A semiconductor device having a layered interconnection structure including a copper film overlying a surface of a semiconductor substrate, wherein the layered interconnection structure includes the copper film and a neighboring film located at at least one of (a) overlying the copper film and (b) between the copper film and the semiconductor substrate, the neighboring film having, as a primary constituent element thereof, an element selected from a group consisting of rhodium, ruthenium, iridium, osmium and platinum, wherein the neighboring film substantially prevents voids due to electromigration of copper.

2. The semiconductor device according to claim 1, further comprising a diffusion barrier layer adjacent the neighboring film, wherein said diffusion barrier layer is at least one film made of material selected from the group consisting of titanium nitride, tungsten and tantalum.

3. A semiconductor device having a layered interconnection structure including a platinum film overlying a surface of a semiconductor substrate, wherein the layered interconnection structure includes the platinum film and a neighboring film located at at least one of (a) overlying the platinum film and (b) between the platinum film and the semiconductor substrate, the neighboring

C₂
wml

film having, as a primary constituent element thereof, an element selected from a group consisting of rhodium, ruthenium, iridium and osmium, wherein the neighboring film substantially prevents voids due to electromigration of the platinum.

4. The semiconductor device according to claim 3, further comprising a diffusion barrier layer adjacent the neighboring film, wherein said diffusion barrier layer is at least one film made of material selected from the group consisting of titanium nitride, tungsten and tantalum.

0585904-110601
C₃

5. A semiconductor device having a layered interconnection structure including a platinum film overlying a surface of a semiconductor substrate, wherein the layered interconnection structure includes the platinum film and a neighboring film located at at least one of (a) overlying the platinum film and (b) between the platinum film and the semiconductor substrate, the neighboring film including an element selected from a group consisting of rhodium, ruthenium, iridium and osmium, wherein the neighboring film substantially prevents voids due to electromigration of the platinum.

6. The semiconductor device according to claim 5, further comprising a diffusion barrier layer adjacent the neighboring film, wherein said diffusion

barrier layer is at least one film made of material selected from the group consisting of titanium nitride, tungsten and tantalum.

7. A semiconductor device having a layered interconnection structure including a platinum film overlying a surface of a semiconductor substrate, wherein the layered interconnection structure includes the platinum film and a neighboring film located at at least one of (a) overlying the platinum film and (b) between the platinum film and the semiconductor substrate, the neighboring film having, as a primary constituent element thereof, an element selected from a group consisting of rhodium, ruthenium, iridium and osmium, wherein the neighboring film substantially prevents voids due to electromigration of the platinum.

8. The semiconductor device according to claim 7, further comprising a diffusion barrier layer adjacent the neighboring film, wherein said diffusion barrier layer is at least one film made of material selected from the group consisting of titanium nitride, tungsten and tantalum.

9. A semiconductor device comprising first layered interconnection structure and second layered interconnection structure, and a plug electrically connecting said first layered interconnection structure and said second layered interconnection structure,

SUB
B37

wherein said first layered interconnection structure includes a first copper film, and a first neighboring film adjacent said first copper film and a first diffusion barrier film adjacent said first neighboring film, said first neighboring film having, as a primary constituent element thereof, an element selected from a group consisting of rhodium, ruthenium, iridium, osmium and platinum, and said first diffusion barrier film having at least one material selected from a group consisting of titanium nitride, tungsten and tantalum, and

wherein said second layered interconnection structure includes a second copper film, and a second neighboring film adjacent said second copper film and a second diffusion barrier film adjacent said second neighboring film, said second neighboring film having, as a primary constituent element thereof, an element selected from a group consisting of rhodium, ruthenium iridium, osmium and platinum, and said second diffusion barrier film having at least one material selected from a group consisting of titanium nitride, tungsten and tantalum.

10. A semiconductor device according to claim 9, wherein said first neighboring film and said first diffusion barrier film are located between said first copper film and said plug, and said second neighboring film and said second diffusion barrier film are located between said second copper film and said plug.

int B4 >

11. A semiconductor device according to claim 9, wherein said plug faces said first copper film and said first neighboring film and a third diffusion barrier film adjacent said plug, and said first neighboring film, said plug, at least said second neighboring film and said second diffusion barrier film are located between said second copper film and said plug.

add B5 >

add
C4 /

ADD E1 >

09985904 110601